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Report on Exact and Statistical Matching Techniques

By Daniel B. Radner

Office of Research and Statistics, Social Security Administration
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The Subcommittee on Matching Techniques of the Federal Committee on Statistical Methodology prepared a *Report on Exact and Statistical Matching Techniques* which has been published as Statistical Policy Working Paper 5 by the Office of Federal Statistical Policy and Standards, U.S. Department of Commerce. The report discusses matching of data files for research and statistical purposes. Matching for other purposes, for example, administrative purposes, is not considered in the report. In the matching considered, identification of units, if needed at all, ordinarily is only necessary to make the match. After matching, that identification can be removed.

Two basic types of matching, exact matching and statistical matching, are discussed. In an exact match, information for the same unit (e.g., person) from two or more files is brought together, ordinarily using identifying information (e.g., name, address, social security number). In contrast, in a statistical match the information brought together from the different files ordinarily is not for the same unit, but is for similar units; the match is made on the basis of similar characteristics, rather than identifying information. (More detailed definitions of these two types appear later in this article.)

From the point of view of accuracy of the matched data, exact matching has ordinarily been preferred to statistical matching. In many cases, for technical or legal reasons, or both, an exact match between two files cannot be carried out. For example, both files might be samples which have few units in common. Legal restrictions on exact matching, which have existed for some time, have been increasing in recent years (e.g., the Privacy Act of 1974 and the Tax Reform Act of 1976). These limitations on the use of exact matching have led to further interest in alternative methods of matching.

The impetus for the information of the subcommittee came from restrictions on the use of exact matching arising from confidentiality considerations. The original question to be examined was to what extent and under what conditions is statistical matching an acceptable alternative to exact matching. Thus, the subcommittee did not examine alternatives to exact matching other than statistical matching.

Although a comprehensive comparison between exact and statistical matching was originally intended, the subcommittee determined that such a comparison was not possible at this time because so little is known about the error structure of statistical matching procedures. For this reason, the subcommittee decided to summarize in the report what is known about exact and statistical matching, to give examples of applications of both types of matching, to make some limited comparisons of exact and statistical matching, and to suggest directions for future research.

Organization of the Report

The report contains the following principal sections which are summarized below:

Chapter I.	Introduction and Overview
Chapter II.	Exact Matching
Chapter III.	Statistical Matching
Chapter IV.	Findings and Recommendations
Appendix I.	Economics, Statistics, and Cooperatives Service Example of Exact Matching
Appendix II.	Office of Research and Statistics Example of Statistical Matching
Appendix III.	Selected Examples of Exact Matching

Chapter I contains discussions of the definitions and uses of matching, various applications and

examples, confidentiality issues, and the role of computers.

Chapter II contains a discussion of exact matching. That discussion includes a brief overview of the nature and history of exact matching, a description of the steps in exact matching procedures, a summary of types of exact matching error, and descriptions of practical problems and reliability. The description of procedures contains sections on the selection of match characteristics and definition of agreement and disagreement for each characteristic, blocking and searching, weighting of characteristics of comparison pairs, determination of thresholds, and validation of decisions. A detailed example of exact matching is presented in Appendix I and summaries of selected examples are shown in Appendix III.

A discussion of statistical matching is presented in Chapter III. Because statistical matching is not a very well-known technique, in Chapter III substantial space is devoted to the nature of statistical matching, and a simple framework within which most statistical matching can be analyzed is presented. Brief discussions of the steps carried out in making a match and two basic types of statistical matching methods are also presented. Then the history and development of statistical matching are described, including summaries of matches carried out at the Bureau of Economic Analysis (U.S. Department of Commerce), the Brookings Institution, Statistics Canada, Yale University, the Office of Tax Analysis (U.S. Treasury Department), the Office of Research and Statistics (Social Security Administration), and Mathematica Policy Research. Discussion of criticisms of statistical matching and types of errors in statistically matched data are also presented, although those discussions are necessarily sketchy since little is known about the reliability of statistical matching. Finally, a summary and conclusions are presented. Appendix II contains a detailed example of statistical matching.

Chapter IV contains the findings and recommendations of the subcommittee, which are presented later in this article. A bibliography of exact and statistical matching references is included at the end of the report.

MEMBERS OF THE SUBCOMMITTEE ON MATCHING TECHNIQUES

(February, 1979)

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Matching Applications

Matching of data files for research or statistical purposes ordinarily is a step in the preparation of the data needed to perform statistical analyses. In assessing the data needed for a given analysis, there often are cases in which one existing data set does not contain all of the variables needed (or contains variables of less than sufficient accuracy). Several different approaches can be used to deal with this problem. One possibility is direct data collection of all the needed variables, for example, in a sample survey. Another possibility is the assignment or imputation of values using statistical techniques such as regression analysis (perhaps using information from another data file). A third possibility is matching two or more existing data sets to add the desired variables, using either exact or statistical matching. Thus, matching is merely one of a larger group of techniques which can be used to add variables needed to perform statistical analyses.

However, there may be cases in which matching, specifically exact matching, is the only feasible method of preparing the needed data. For exam-

ple, cumulative health histories of sufficient accuracy might require the exact matching of hospital records. There are also cases in which a comparison of the presence of units in two files, rather than the addition of variables, is needed. In this type of application, there are few, if any, alternatives to exact matching. Where the goal is the construction of a multipurpose file, rather than performing a specific analysis, exact and statistical matching can be particularly appropriate because large numbers of variables can be added relatively easily using matching.

The subcommittee collected many examples of matching of data files. The applications can be divided into two broad categories: (1) adding to a base file more variables or additional reports on the same variables; and (2) comparing the presence of units in two files. Within type (1) several different kinds of applications can be identified. One application is the addition of more variables to enrich analyses or to make possible analyses which otherwise could not be done. Both exact and statistical matching have been used in this application. A cross-section example of one such exact match is the addition of Social Security Administration age, race, and sex data to Federal individual income tax return records in order to make it possible to analyze income and tax data by those characteristics. In another cross-section example, a statistical match was carried out at the Bureau of Economic Analysis, U.S. Department of Commerce, between observations from a household survey and a sample of Federal individual income tax returns in order to add more detailed and more accurate income information to the household survey data. A longitudinal example of exact matching is the linkage of hospital admission and separation records into cumulative health histories.

Another kind of application within type (1) is the evaluation of data, in which initial variables are compared with added variables, or with additional reports on the same variables—from other existing sources or from special evaluation surveys. Evaluation of the accuracy of data was carried out using the 1973 Current Population Survey—Internal Revenue Service—Social Security Administration Exact Match Study. In that project, the income data from the different data sources were compared and response and reporting errors were analyzed.

In type (2) (comparing the presence of units in two files), two different kinds of applications can be identified: evaluation of coverage and construction of more comprehensive lists. The Bureau of the Census has conducted numerous coverage evaluation studies in connection with the decennial censuses. In such matches, the emphasis is upon the presence of units in the files, rather than upon the relationships between data in the two files. In an example of list construction, the Economics, Statistics, and Cooperatives Service of the U.S. Department of Agriculture uses exact matching in the construction of a master list sampling frame of farms in each State. This master list is constructed from several different lists, and exact matching is used to detect duplication between (and within) the different lists. Statistical matching is not appropriate for type (2) applications.

In most of the applications mentioned above, one possible effect of matching was a reduction of response "burden." That is, to collect the same information without matching would have required a considerable amount of direct data collection. Also, in some of those applications, cost reduction was a beneficial effect—that is, matching was less expensive than direct collection of the same combination of data would have been. The Office of Federal Statistical Policy and Standards suggested the use of statistical matching to reduce response burden and cost by means of what are called "nested surveys." In such surveys, different samples from the same population are asked separate sets of questions, with a core of questions in common. The data from these different samples can then be statistically matched to obtain relationships among the items not in the common core of questions.

Findings and Recommendations

FINDINGS

Definitions of Exact and Statistical Matching.—Although the terms "exact" and "statistical" matching have been used frequently in the literature, the subcommittee found no generally agreed upon definitions of these terms. For purposes of this report, the subcommittee defined a match as a linkage of records from two or more files containing units from the same population. It defined an exact match as a match in which the linkage of data for the same unit (e.g., person) from the different files is sought; linkages for units that are not the same occur only as a result of error.

The subcommittee defined a statistical match as a match in which the linkage of data for the same unit from the different files either is not sought or is sought but finding such linkages is not essential to the procedure. In a statistical match, the linkage of data for similar units rather than for the same unit is acceptable and expected. Statistical matching ordinarily has been used where the files being matched were samples with few or no units in common; thus, linkage for the same unit was not possible for most units.

The definition of a match used in the report excludes such record linkage techniques as the "hot deck" allocation of values to nonrespondents in surveys because those techniques are considered to involve only one file.

Usefulness of Matching.—Matching of microdata sets is very useful for research and statistical purposes. Through the use of matching, it often is possible to carry out analyses or make estimates at a lower cost or in a shorter time than by alternative methods (e.g., a sample survey). In some cases, matching is the only feasible way of doing the research. Analyses or estimates obtained through matching sometimes are more reliable than those obtained in other ways (e.g., for some kinds of information, matched administrative record data are more accurate than survey responses). Also, matching often produces a reduction in response burden.

Application of Exact and Statistical Matching.—Exact matching has been used for all of the purposes listed earlier. Statistical matching is inherently unsuitable for many purposes. For example, analyses of census or survey coverage using record checks require matching of the same units (e.g., persons). Also, the construction of cumulative health histories and tests of treatment effects ordinarily require exact matching. If we want to compare the earnings of persons who have had a given training program with those who have not, a statistical match between a list of trainees and earnings records would not give useful results unless the earnings observations could be separated into persons who had been trained and persons who had not.

However, statistical matching has been used for several purposes. One is the construction of microdata bases for policy analysis (e.g., for the analysis of the effects of current laws and programs and the estimation of the costs and effects of proposed changes). Another purpose is the construction of estimates of the distributions of various economic variables (e.g., income, taxes, and wealth). Other purposes involve the addition of variables to make possible or broaden the analyses to be performed. Statistical matching has rarely, if ever, been used to combine microdata files which could be combined using an exact match.

Comparison of Errors.—When there is a choice between statistical and exact matching, estimates of parameters of the joint distribution of variables in the different files will almost certainly have less error if based upon exact matching. To the extent that records for the same person are successfully linked in an exact match, such estimates will be based upon data sets in which all the values of the variables for each person are in fact for that person; whereas in statistical matching, most or all of them are for a person with similar characteristics but not the same person.

Error in exactly matched data has been studied and its effect can be estimated in many cases. On the other hand, little is known about the nature and extent of the errors present in data resulting from a statistical match. Most of the literature on statistical matching has consisted of descriptions of matches preformed, with little evidence presented on the errors in the matched results. These errors are very difficult to estimate. Thus, given what is known at this time, statistical matching ordinarily is not a satisfactory substitute for exact matching when exact matching is feasible.

Comparison of Relative Risk of Disclosure and Potential for Harm to Individuals.—Confidentiality problems clearly are greater for exact matches than for statistical matches for two reasons. First, if personal identifiers are used (as they usually are in exact matching), units (e.g., persons) must be identified, at least at some stage of the matching. Second, in an exact match (assuming that the true match is found) the matched file contains more information regarding the person than either of the original files. Thus, there is an increased probability of a record in the matched file being identifiable even after the removal of the personal identifiers. However, in most applications that probability is still very small. These problems exist to a lesser degree in the case of statistical matching. Protective measures against disclosure can be taken in both cases, but for exact matches they may entail greater expense and/or some loss of information.

The potential for harm to individuals resulting from inadvertent disclosure of identifiable records depends on the amount and sensitivity of information in those records. Since exact matching increases the amount of information in individual records, it can increase the potential for harm resulting from inadvertent disclosure. However, the subcommittee believes that the Federal agency exact matching projects for statistical purposes which it has reviewed have been carried out with sufficient safeguards to insure a very small risk of harm to specific individuals resulting from inadvertent disclosure of information about them in the matched files.

Legal Obstacles to Exact Matching.—Over the past 6 years, there have been significant changes in the laws and regulations pertinent to exact matching of records for statistical and research purposes. New laws, especially the Privacy Act of 1974 and the Tax Reform Act of 1976, have imposed significant new restrictions on the matching of records belonging to more than one Federal agency and on the matching of Federal agency records with those of other organizations.

While the subcommittee believes that some restrictions are essential to prevent the improper use of individual records, it also believes that some of the restrictions now in force have unduly inhibited the conduct of research studies based on exact matching of records.

RECOMMENDATIONS

Choice Between Exact and Statistical Matching.—If the conditions are such that there is a choice between exact and statistical matching, several factors mentioned below should be considered in choosing between the two types of matching. Great uncertainty exists regarding the error present in statistical match results; few attempts have been made to measure that error. Much more is known about the error present in exact match results. Taking into account the work that has been done and based upon theoretical considerations, in general the results of an exact match are likely to contain far less error. No general comparison of resource costs and time required by exact and statistical matching can be made since these factors are very sensitive to the data files and methods used. Confidentiality and privacy considerations favor statistical matching, although the risk of disclosure from an exact match carried out for statistical purposes and done with the proper safeguards is small. When there is a choice between exact and statistical matching, the subcommittee believes that a careful review of these factors would usually lead to the use of exact matching.

Documentation of Matches.—In cases in which the matched files will be used by outsiders or when the matching techniques are of interest to outsiders, the matching should be documented carefully, even though substantial resources might be required for that task. Many of the matches which have been carried out have not been documented adequately. The documentation should include descriptions of the files matched and the matching procedure. Adequate documentation allows others to assess the quality and usefulness of the match and provides the information necessary for performing similar matches. Information about the cost of the match should be included. In addition, it is very important to compile and provide information concerning errors in the matched results. Documentation is especially important when the match is likely to be repeated or the results will be used for important policy decisions.

Public Release of Matched Data.—If there is a demand for a matched microdata file, the release to the public of that file, *after it has been determined that safeguards against inadvertent disclosure are adequate,* should be encouraged. (The report of the Subcommittee on Disclosure-Avoidance Techniques of the Federal Committee on Statistical Methodology, Statistical Policy Working Paper 2, provides a detailed discussion of the disclosure problems which might be involved.) Even if the files which were matched were each previously reviewed for disclosure potential, another review is needed before the merged file can be released because the presence of more data for each unit (e.g., person) might make it easier to identify. Full use of matched data should be encouraged. Such matched files frequently are of great use to researchers outside the group making the match.

Confidentiality Restrictions on Matching.—Since exact matching is the only feasible or efficient method for many important statistical applications, the subcommittee urges caution in the development and implementation of statutes, regulations and policies embodying confidentiality restrictions. In adopting measures for the protection of confidentiality, the distinction between record matching for administrative and for statistical purposes needs to be recognized. The purpose of adminis-

trative matching is to gather the information needed for taking administrative action with respect to each individual, and the individual's identification is therefore a key element of the matched file. In matching for statistical purposes, the individual is of interest only as a link for bringing together relevant information; once that is done, the personal identifiers (name, etc.) are usually of no further use and are dropped from the file, and the records become anonymous statistical units to be grouped with others for analysis. Interagency transfer of data with identifiers for this limited but important purpose should be recognized as a needed research tool and should be facilitated under strict controls protecting the files from unauthorized disclosure at any stage. Legislation permitting transfer of identifiable data for statistical purposes within "protected enclaves" as recommended by the Director of the Office of Federal Statistical Policy and Standards would, in the subcommittee's judgment, be the most straightforward and effective means of achieving this goal.

Research.—More research on errors present in exact match results is needed. Research to develop improved methods of carrying out exact matches (e.g., assessing and reducing errors in various types of personal identifiers; better methods of determining optimal weights and thresholds) would be very useful.

A substantial amount of research on statistical matching is needed, regarding both optimal methods of matching and estimation of errors present in the matched results. Several promising research strategies have been suggested. For example, the results of exact and statistical matching of the same files can be compared. Also, tests to study the sensitivity of the results to the assumptions made in carrying out a match should be used more often.

Seminar on Exact and Statistical Matching Techniques

The Office of Federal Statistical Policy and Standards, Department of Commerce, organized a seminar for Federal employees to discuss the material covered in this report. The members of the subcommittee conducted the seminar.

The seminar discussed exact and statistical matching techniques. The findings and recommendations of the subcommittee were discussed in detail.

CURRENT DEVELOPMENTS

SEASONALLY ADJUSTED LABOR FORCE DATA FOR HISPANICS

The Bureau of Labor Statistics now publishes seasonally adjusted monthly and quarterly employment and unemployment data for persons of Hispanic origin. These data make available, for the first time, monthly Hispanic labor force estimates consistent with what is presently available for black and white Americans. The new data appear in the Bureau's monthly "Employment Situation" news release, beginning with the release of June data. Quarterly data are published in *Employment in Perspective: Minority Workers*. The second quarter 1980 issue (BLS Report 616) describes the new data series.

To receive either the news release or the report on a regular basis, contact the Bureau of Labor Statistics, Office of Publications, 441 G Street, N.W., Washington, D.C. 20212, telephone (202) 523-1221. (HARVEY HAMEL, BUREAU OF LABOR STATISTICS, DEPARTMENT OF LABOR, telephone (202) 523-1371)

HOW TO JUDGE INDUSTRY PERFORMANCE: BIE STUDY POINTS OUT COMPLEXITY

The criteria for evaluating the economic performance of U.S. manufacturing industries must take into account the multiplicity of our national goals, cautions the study—"Evaluating the Economic Performance of U.S. Manufacturing Industries." The study by the Bureau of Industrial Economics of the Commerce Department develops six measures that reflect output growth, price trends, return to factors of production, and foreign competitiveness. Twenty-two manufacturing industries were evaluated on the basis of these measures. Several explanatory variables were also studied.

The study appears in the *Industrial Economics Review* along with articles on the "Industry Profile of the Current Recession," "Energy Usage Trends for Selected Manufacturing Industries," "Inflationary Pressures in the Softwood Lumber and Softwood Plywood Industries in the 1980's," and "Geographic Distribution of Manufacturing Activity."

Single copies of the *Industrial Economics Review* are available from Public Affairs, Bureau of Industrial Economics, U.S. Department of Commerce, Room 1003, Washington, D.C. 20230, telephone (202) 377-1409. (PATRICK MACAULEY, BUREAU OF INDUSTRIAL ECONOMICS, DEPARTMENT OF COMMERCE, telephone (202) 566-7655)

SIZE OF COLLECTIVE BARGAINING SETTLEMENTS COVERING STATE AND LOCAL GOVERNMENT EMPLOYEES

The Bureau of Labor Statistics recently released information on the size of major collective bargaining settlements reached in 1979 covering State and local government employees. The Bureau collected data on settlements covering 5,000 workers or more and analyzed both wage-rate changes and total wage-fringe package increases.

The data are similar to those published quarterly on agreements in the private sector. For the private sector, costs attributed to individual settlements are estimated and statistical summaries are presented on wage-rate changes in bargaining units of 1,000 workers or more and wage and benefit (package) changes in units covering 5,000 workers or more.

A news release on public sector agreements will be issued twice a year and the data also will be presented in *Current Wage Developments*, a monthly publication of the Bureau of Labor Statistics. A mailing list for distribution of the news release is being developed by the Office of Wages and Industrial Relations, Bureau of Labor Statistics, Washington, D.C. 20212. (VICTOR J. SHEIFER, BUREAU OF LABOR STATISTICS, DEPARTMENT OF LABOR, telephone (202) 523-1508)

UPDATED SSA STUDY OF FILIAL RESPONSIBILITY

The Office of Research and Statistics of the So-

cial Security Administration has recently released a report reevaluating the current practice of filial responsibility in the United States and its relationship to changing social security programs.

Current attention focuses on concepts for national health insurance, the effectiveness of rehabilitation programs for the disabled, family assistance allowances, and supplemental security income. All have a part in the social security program and each affects or is affected by current family status. A generation born as the Social Security Act was becoming law is now grown to the point where its parents are today's elderly and its children are still claiming financial and emotional support from them.

". . . . thy father & thy mother . . . ." a second look at filial responsibility and family policy centers on filial responsibility—the responsibility for parents exercised by children. The term is used broadly by the author, Alvin Schorr, to cover duties required by law, by custom, or by personal attitude. At some points, legal responsibility is dealt with specifically. Schorr, professor of family and child welfare at Case Western Reserve University, prepared the study as an extensive revision and update of a 1960 SSA study which evaluated the impact of social security programs on American families.

Requests for single copies of *". . . thy father & thy mother . . ."* may be obtained from the Publications Staff, Office of Research and Statistics, 1875 Connecticut Ave., N.W., Room 1120 Universal North Building, Washington, D.C. 20009. (ROBERT E. ROBINSON, SOCIAL SECURITY ADMINISTRATION, DEPARTMENT OF HEALTH AND HUMAN SERVICES, telephone (202) 673-5209)

NCES FACILITATES ACCESS TO LONGITUDINAL STUDY FILES

The National Center for Education Statistics announces the impending availability of computer tapes containing intact release files or user specified subsets of data from "High School and Beyond" (HS&B), a National Longitudinal Study designed to follow young people during the critical period of transition from high school to postsecondary education, work, and family formation. Conducted early in 1980 in both public and private secondary schools, the base-year sample survey is nationally and regionally representative of high school sophomores and seniors. Separate data files will be available covering: student questionnaires and cognitive tests; school questionnaires; teachers' comments; and second-language questionnaires for students. These files will be available in a variety of formats, including merged subsets. The user of these data files will have the opportunity to analyze data and subsequently report findings that can assist decisionmakers in developing educational policy at the Federal, State, and local levels. There is also the possibility of comparing HS&B findings with base-year data from the study, High School Class of 1972 (NLS-72), the other ongoing national longitudinal study, sponsored by NCES. This earlier study has recently completed its fourth follow-up survey. (NLS-72 reports and data tapes are currently available from NCES.)

The student sample for HS&B represents one of the largest national cross-sections of high school students ever for which data of comparable scope have been assembled. The longitudinal design of the study calls for follow-up surveys to substantial subsets of the two cohorts at roughly two-year intervals. In order to permit separate analyses, several student subpopulations were oversampled, notably Hispanic students and students in alternative, and Catholic or other nonpublic schools.

Information available to the researcher on the data files includes indentification codes, scores from test battery, information on high schools, teacher comments about students, self-reported student data, sampling weights, and analytic indices. Specific student data collected include (1) educational and vocational experiences, (2) plans and aspirations, (3) factors believed to influence educational and career choices, (4) familiarity with financial aid sources for postsecondary education and training, and (5) values and opinions as they relate to attitudes about education and the future. Over 58,000 students from over 1,000 schools participated in the first phase of the 1980 longitudinal study.

Editing.—Users' manuals will give the extent and details of the editing of the HS&B files. The file processing involved verification, cleaning, and supplementary coding of the original data. Information that would permit identification of students or schools has been edited out of the release files. Supplementary codes have been inserted in the data files to indicate the location and nature of violations of written instructions and routing patterns made by respondents.

Subsetting of Master Files.—Because of the immense size of past and present NCES longitudinal data files, some potential users have been discouraged simply because management of such files would have caused unnecessary strain on their computer systems. Awareness of this problem by NCES prompted the development of alternative dissemination plans. It is now possible for NCES to produce customized subfiles in either a raw data or SAS (Statistical Analysis System) file format, using specifications supplied by the user. Users need only select the variables in which they are interested. If the user elects to subset, the subfile will automatically contain not only the specified variables but also a core of variables (basic composites, activity states, sampling weights, etc.) found by researchers to be of value in many kinds of analyses. The user also receives with his/her data tape(s) a computer printout with frequencies for specific discrete variables on the subfile.

Obtaining Information on How to Order Data Files.—Potential users of HS&B data files should request information on the availability of the Users Manual by contacting Jeff Owings, NCES, Longitudinal Studies Branch, FOB-6, 400 Maryland Ave., Washington, D.C. 20202, telephone (301) 436-6688. Careful study of the Users Manual will prepare the user for choosing the data files (or subsets of merged data files) needed for analyses. The manual contains detailed information on master files, sampling techniques and weighting factors. Technical assistance is available via telephone if there are any questions not fully answered by the manual. Using an order form included with the Users' Manual, the user can request any of the following options as raw data or SAS files:

Option 1—The intact master release files as IBM standard labeled, 9-Track 1600 or 6250 BPI density EBCDIC coded tapes.

Option 2—The intact master release files as tapes specified to your computer system, (e.g., 7-Track, 800 BPI, unlabeled).

Option 3—Subsets, consisting of user-selected variables and/or population subfiles, chosen from data contained on any or all of the release files. These subsets will be written to tape files specific to your computer system.

The potential user who desires further information on specific file availability or on costs of both subsetting and tape files should contact the Longitudinal Study Branch of NCES at the telephone number given above. (O. JEAN BRANDES, NATIONAL CENTER FOR EDUCATION STATISTICS, DEPARTMENT OF EDUCATION, telephone (301) 436-7873)

COLLEGE FACULTY SALARIES, TENURE, AND FRINGE BENEFITS

The National Center for Education Statistics has made available a report entitled *Women Faculty Still Lag in Salary and Tenure for the 1979-80 Academic Year.* It is based on preliminary data collected from 2,242 of the 3,190 institutional units in the survey of salaries, tenure, and fringe benefits of fulltime instructional faculty, a part of the 14th annual Higher Education General Information Survey (HEGIS). Highlights of the preliminary tabulations show:

- The average salary was $21,941 for men, but only $17,922 for women on 9-month contracts.
- The mean salaries of faculty employed by the same institution for the last 2 years increased at the same rate (8.2 percent) for both public and private institutions.
- 68 percent of the men compared to 48 percent of the women faculty were tenured in academic year 1979-80.
- The number of full-time instructional faculty on 9-month contracts increased only 0.9 percent.

The report contains 11 tables covering salaries, tenure, and fringe benefits of full-time instructional faculty. Data are aggregated by level and control of institution and by sex and academic rank of faculty members.

Further information on the survey may be obtained from the author, Carolyn R. Smith, telephone (301) 436-6425. Single copies of the report entitled *Women Faculty Still Lag in Salary and Tenure for the 1979-80 Academic Year* (NCES-80-342) may be obtained from the Statistical Information Office, 1001 Presidential Building, 400 Maryland Avenue, S.W., Washington, D.C. 20202, telephone (301) 436-7900. Information about computer tapes containing all data collected by the survey may be

obtained from the Data Systems Branch, National Center for Education Statistics 1001 Presidential Building, 400 Maryland Avenue, S.W., Washington, D.C. 20202, telephone (301) 436-7944. (O. JEAN BRANDES, NATIONAL CENTER FOR EDUCATION STATISTICS, DEPARTMENT OF EDUCATION, telephone (301) 436-7873)

SCHOOL ENROLLMENT—SOCIAL AND ECONOMIC CHARACTERISTICS OF STUDENTS: OCTOBER 1979 (ADVANCE REPORT)

The Bureau of the Census has recently issued a report entitled, "School Enrollment—Social and Economic Characteristics of Students: October 1979 (Advance Report)." This report presents a summary of trends in school enrollment based on data from the October 1979 Current Population Survey (CPS) and earlier surveys.

Elementary school enrollment declined in 1979, continuing the trend begun in the early 1970's. About 28 million children were attending grades 1 to 8 in 1979 compared with 34 million in 1970. High school enrollment totaled 15.1 million in 1979, a significant decline from the number enrolled 2 years earlier.

The nunber of persons 14 to 34 years old enrolled in college has not changed substantially since 1975; about 10 million persons were enrolled in 1979. A slight decline in the number of men enrolled and a simultaneous rise in the number of women from 1975 to 1979 has resulted in the number of men and women being about the same in 1979.

Below age 35, about 5 million men and 5 million women were enrolled in college, but among students 35 years old and over, there were 914,000 women and 487,000 men in college. Over one-third (36 percent) of all college students were 25 years old and over, but most of the older students were enrolled part time; of students attending full time, only 16 percent were 25 years old and over.

Black college enrollment has been at or near 1 million since 1975. As a proportion of all college students 14 to 34 years old, Blacks were about 10 percent in 1979, slightly less than their proportion of the college-age population but a higher percentage than at the beginning of the decade.

Copies of the report, "School Enrollment—Social and Economic Characteristics of Students: October 1979 (Advance Report)," *Current Population Reports,* Series P-20, No. 355 (pp. 11, $1.25) are for sale from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, or at Commerce Department district offices. (ANDREA ADAMS, BUREAU OF THE CENSUS, DEPARTMENT OF COMMERCE, telephone (301) 763-5050)

SOCIAL INDICATORS III

The Bureau of the Census has recently announced the forthcoming release of the report, *Social Indicators III.* This is the third in a series of triennial chartbooks designed to provide a comprehensive overview of current social conditions and trends in the United States. This report is scheduled for release by the U.S. Government Printing Office in the fall of 1980.

The main topics covered in the report are treated in 11 chapters: Population and the Family; Health and Nutrition; Housing and the Environment; Transportation; Public Safety; Education and Training; Work; Social Security and Welfare; Income and Productivity; Social Participation; and Culture, Leisure and Use of Time. In addition, the introductory chapter provides an overview of quality of life in the United States, together with three bibliographies, relating to major English-language studies in the field, other national social indicator reports, and U.S. State and local-area social indicator reports, respectively. Each chapter also includes selected references to further reading and the names and addresses of key resource persons from whom additional information may be obtained. Information on sources and quality of the data (Appendix A), a glossary of terms (Appendix B) and an index are provided at the end of the report.

The report will again be supplemented by separate publication of a special issue of *The Annals* of the American Academy of Political and Social Science, edited by Dr. Conrad Taeuber of Georgetown University. Like its predecessor (Volume 435), that issue will be devoted to essays based on individual chapters of *Social Indicators III* or relating to crosscutting topics or issues. It is scheduled to appear in January 1981 as Volume 453 of *The Annals.*

The price and stock number of *Social Indicators III* will be given on order forms and other advertisements as soon as the report is available for distribution. Orders for the report, enclosing payment payable to the Superintendent of Documents, may then be addressed to the U.S. Government Printing Office, Washington, D.C. 20402. (DENIS F. JOHNSTON, BUREAU OF THE CENSUS, DEPARTMENT OF COMMERCE, telephone (301) 763-5145)

RECENT NSF REPORTS

The National Science Foundation has recently released the following reports which are briefly described:

Science and Engineering Personnel: A National Overview (NSF 80-316) contains an integrated overview of current utilization and supply patterns for all U.S. scientists and engineers. A detailed examination of the status of doctoral scientists and engineers as well as the dynamics of the science and engineering (S/E) labor market—i.e., the flows into and out of science and engineering—are included. Appendix tables provide a comprehensive summary of data on S/E personnel. These tables will be maintained and updated in successive editions. Analyses of current interest will continue to be presented, although they may vary from volume to volume.

This report will be a useful complement to the National Science Board's periodic *Science Indicators* series and to the recently inaugurated *National Patterns of Science and Technology* series.

Copies of the report (NSF 80-316) are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 for $4.25 per copy. Request stock number 038-000-00461-1.

Federal Funds for Research and Development, Fiscal Years 1978, 1979, and 1980, Volume XXVIII (NSF 80-315) covers R&D funding requests by the agencies shown in the 1980 budget plus subsequent congressional appropriation actions and the effects of proposed rescissions. It also includes an analysis by budget function and a special study of 1970-80 funding for research by detailed fields of science.

Summarized data were published in *Science Resources Studies Highlights,* "Real Growth Unlikely in 1980 Federal R&D Funding," dated November 16, 1979. Copies of the *Highlights* are available without charge from the Division of Science Resources Studies, National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550.

Copies of the report (NSF 80-315) are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 for $3.75 per copy. Request stock number 038-000-00460-3.

Also issued is the following *Science Resources Studies Highlights:*

"March Cutback in Federal Budget Leaves Strong Defense R&D Growth in 1981—Other Areas Lag" (NSF 80-319) reports on data taken from a special report, *Federal R&D Funding by Budget Function: Fiscal Years 1979-81,* relating to the current budget period. Data show funding levels as presented in the President's 1981 budget in January and also the revisions made in March. Data are based on information provided by the agencies for "Special Analysis K: Research and Development" in the 1981 budget; on further detailed program information in agency budget justification documents; on *Fiscal Year 1981 Budget Revisions, March 1980* and a paper "Research and Development Revisions to the Fiscal Year 1981 Budget," dated April 17, 1980, both issued by the Office of Management and Budget; and on budget amendment justifications issued by the agencies.

Copies of the *Highlights* are available without charge from the Division of Science Resources Studies, National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550. (CHARLES E. FALK, DIVISION OF SCIENCE RESOURCES STUDIES, NATIONAL SCIENCE FOUNDATION, telephone (202) 634-4634)

INDIVIDUAL INCOME TAX RETURNS DATA FOR 1977

The Internal Revenue Service has released *Statistics of Income—1977, Individual Income Tax Returns.* The statistics in the report are based on a sample selected from the 86.6 million returns filed by taxpayers during Calendar Year 1978.

Data highlighted are sources of income, exemptions, deductions, and income tax classified by size of taxpayers' adjusted gross income for the Nation. Data are also classified by marital status of tax-

payers, taxable and nontaxable returns, taxpayers age 65 or over, and by State.

The publication contains data on taxpayers claiming itemized deductions such as for medical and dental expenses, charitable contributions, interest (including home mortgage), taxes, and casualty and theft losses. The report includes information on the zero bracket amount, which replaced the standard deduction, the "new jobs" credit, and the disability income exclusion which replaced the sick pay exclusion. Data are also provided on high income returns classified by three new income concepts as defined and required by the Tax Reform Act of 1976.

Also shown is information on the computation of income tax, minimum, maximum, and alternative tax, and tax-payments, overpayments, and balance due.

This 286–page IRS Publication No. 79 may be purchased for $7 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. (RAY PLOWDEN, INTERNAL REVENUE SERVICE, DEPARTMENT OF THE TREASURY, telephone (202) 376-0155)

INDIVIDUAL RETIREMENT ARRANGEMENTS, 1976

The Internal Revenue Service has recently released the *Supplemental Report, Statistics of Income—1976, Individual Retirement Arrangements* based upon Forms 1040, 5329, and 5498 filed for Calendar Year 1976. The report presents data by type of arrangement, source of compensation reported on Form 1040, and size of adjusted gross income. Data are also provided for arrangements with and without contributions.

Highlights include number of arrangements and amount of contributions, compensation, distributions, penalty taxes, and a percentage distribution of Individual Retirement Arrangements and contributions by size of adjusted gross income.

Copies of the 37-page report (Stock No. 048-004-01736-9) can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 for $2.50. (JOHN DIPAOLO, BUSINESS AND PENSION STATISTICS SECTION, STATISTICS DIVISION, INTERNAL REVENUE SERVICE, telephone (202) 376-0151)

RECENT PUBLICATIONS OF THE UN STATISTICAL OFFICE

The following briefly describes recent publications issued by the Statistical Office of the United Nations. Copies of these documents may be purchased from the Sales Section, United Nations, New York, New York 10017. When ordering, please use the price and stock number included in the description. Government agencies should request the discount to which they are entitled, as it is not automatically given.

Yearbook of Industrial Statistics, 1978 edition. Vol. I, General Industrial Statistics (Statistical Papers, Series P, No. 17 (Vol. I); xi + 645 pp.; UN Sales No. E.80.XVII.9; $35.00); *Vol. II, Commodity Production Data, 1969-1978,* Statistical Papers, Series P, No. 17 (Vol. II); viii + 747 pp.; UN Sales No. E.80.XVII.10; $35.00).—This is the twelfth in a series of annual compilations of industrial statistics. Volume I contains data for 99 countries. The following items are covered for each branch of industry: number of establishments; employment; compensation of employees; hours worked by operatives; quantity of electricity consumed; gross output; value added; gross fixed capital formation; value of stocks; and index numbers of industrial production. In addition, special tables are included on the growth of industrial production and employment in the major regions and in the world as a whole.

Volume II presents information on production in about 200 countries of selected industrial commodities in the years 1969-1978. Quality data for a standard list of 534 commodities (576 statistical series) were collected by questionnaire from all major developed countries and most of the developing ones. The series are shown on a commodity-by-country basis and are arranged according to the International Standard Industrial Classification (ISIC) industry groups of which the commodities are principal products. All branches of mining and manufacturing are represented.

Yearbook of Construction Statistics, 1969-1978 (Statistical Papers, Series U, No. 7; 298 pp.; UN Sales No. E.80.XVII.12; $25.00).—This is the seventh issue in a series of annual compilations of statistics on construction activity. This publication presents data for 122 countries or areas. The national tables contain, in general, two different sets of data. The first are estimates from annual sur-

veys of units engaged in construction. The second are derived from information collected by local authorities for regulatory or control purposes. The following items are covered: general indicators of activity (employment and earnings, value of output and value added), fixed assets, permits authorized for building and dwelling construction and building construction and dwellings completed. In addition, international tables are included on dwelling construction and index numbers of construction activity, by countries.

PERSONNEL NOTES

DEPARTMENT OF EDUCATION

National Center for Education Statistics: MACKNIGHT BLACK has replaced Richard Scarfo as Administrative Officer. Mr. Black has served as a Senior Program Officer in the Office of Compensatory Education and as Administrative Officer, Office of Economic and Manpower Studies, National Science Foundation.

IRIS SILVERMAN, formerly Iris Garfield and the Center's Planning Officer, has taken over as Executive Director of the Advisory Council on Education Statistics, replacing Robert Calvert who has been named Deputy Assistant Administrator, Division of Statistical Service.

FEDERAL RESERVE BOARD

Division of Research and Statistics: DAVID HUMPHREY, formerly a Senior Economist in the Financial Studies Section, has been promoted to Chief of that section. RICHARD STOUT, Ph.D. candidate from the Indiana University, joined the Board's staff as an Economist in the Mortgage and Consumer Finance Section. DAVID GREEN, Ph.D. candidate from Columbia University, joined the Board's staff as an Economist assigned to the Wages, Prices, Productivity Section. WILLIAM LEE, Ph.D. candidate from Columbia University, joined the Board's staff as an Economist assigned to the Econometric and Computer Applications Section.

DEPARTMENT OF HEALTH AND HUMAN SERVICES

National Center for Health Services Research: GERALD ROSENTHAL, Director of the National Center for Health Services Research (NCHSR), has been named to coordinate health services research under the U.S.-Mexico Border Health Initiative, a binational effort to improve health services for the people living near the 1,950-mile border between the United States and Mexico. He will be based at the Pan American Health Organization's field office in El Paso.

BARBARA P. MCCOOL has been appointed as Acting Director of NCHSR. She was named Deputy Director in July, and is a former associate professor of Health Administration at Duke University.

DEPARTMENT OF JUSTICE

Immigration and Naturalization Service: DOROTHEE KRAHN, formerly with the Office of Survey Design of the Bureau of Labor Statistics, and ROGER KRAMER, formerly with the International Demographic Data Center of the Bureau of the Census, have joined the Statistical Analysis Branch of the Immigration and Naturalization Service as the senior statisticians for nonimmigrant arrival and immigration statistics, respectively.

VETERANS ADMINISTRATION

Office of Controller: ROBERT W. SCHULTZ, formerly Assistant Director for Research and Biometrics, has been promoted to Director, Reports and Statistics Service, Office of Controller.

SCHEDULE OF RELEASE DATES FOR PRINCIPAL FEDERAL ECONOMIC INDICATORS

December 1980

Release dates scheduled by agencies responsible for the principal economic indicators of the Federal Government are given below. *These are target dates* that will be met in the majority of cases. *Occasionally agencies may be able to release dates a day or so earlier or may be forced by unavoidable compilation problems to release a report one or more days later.* In certain cases,* timing variability in the receipt of raw data requires a range of dates rather than a specific release date.

A similar schedule will be shown here each month covering release dates for the following month. The indicators are identified by the title of the releases in which they are included; the source agency; and the release identification number where applicable. Release date information for additional series can be found in publications of the sponsoring agencies.

(Any inquiries about these series should be directed to the issuing agency.)

Date		*Subject*	*Data For*
December	1	Construction Expenditures (Press release), Census, C-30	October
	1	Composite Indexes of Leading, Coincident, and Lagging Indicators (Press release), Bureau of Economic Analysis (BEA)	October
	2	Selected Interest Rates, Federal Reserve Board (FRB), G. 13	November
	3	Sales, Inventories of Single-Family Homes, Census, C-25	October
	4	Manufacturers' Shipments, Inventories, and Orders, Census, M3-1	October
	*4-5	Consumer Installment Credit, FRB, G. 19	October
	5	Producer Price Indexes (Press release), Bureau of Labor Statistics (BLS)	November
	5	The Employment Situation (Press release), BLS	November
	5	Factors Affecting Bank Reserves and Condition Statement of Federal Reserve Banks, FRB, H.4.1	Week Ending December 3
	5	Weekly Consolidated Condition Report of Large Commercial Banks and Domestic Subsidiaries, FRB, H.4.2	Week Ending November 26
	5	Money Stock Measures, FRB, H.6	Week Ending November 26
	9	Quarterly Financial Report for Manufacturing Corporations, Federal Trade Commission	3Q'80

10 Plant and Equipment Expenditures, BEA ..... 3Q'80
10 Manufacturers' Export Sales and Orders, Census, M4-A ..... October
10 Advance Monthly Retail Sales (Press release), Census (54) ..... November
10 Crop Production, Agriculture ..... December 1
11 Monthly Wholesale Trade (Press release), Census, BW ..... October
11 Supply/Demand Estimates, Agriculture ..... Current Marketing Season
12 Monthly Selected Services Receipts (Press release), Census ..... October
12 Factors Affecting Bank Reserves and Condition Statement of Federal Reserve Banks FRB, H.4.1 ..... Week Ending December 10
12 Weekly Consolidated Condition Report of Large Commercial Banks and Domestic Subsidiaries, FRB, H.4.2. ..... Week Ending December 3
12 Money Stock Measures, FRB, H.6 ..... Week Ending December 3
15 Manufacturing and Trade: Inventories and Sales, Census ..... October
15 Cattle on Feed, Agriculture ..... December 1
15 Yields on FHA Insured New Home 30-year Mortgages, HUD ..... December 1
16 Housing Starts (Press release), Census, C-20 .. November
*15-17 Industrial Production, FRB, G.12.3 ..... November
*16-18 Capacity Utilization: Manufacturing and Materials, FRB, G.3 ..... November
18 Summary of U.S. International Transactions, BEA ..... 3Q'80
18 Personal Income and Outlays, BEA ..... November
19 Advance Report on Durable Goods, Manufacturers' Shipments and Orders (Press release), Census, M3-1 ..... November
19 Manufacturing Capacity Utilization, BEA .... September
19 Corporate Profits (Revised), BEA ..... 3Q'80
19 Gross National Product (Second Revision), BEA .. 3Q'80
19 Factors Affecting Bank Reserves and Condition Statement of Federal Reserve Banks, FRB, H.4.1 ..... Week Ending December 17
19 Weekly Consolidated Condition Report of Large Commercial Banks and Domestic Subsidiaries, FRB, H.4.2 ..... Week Ending December 10
19 Money Stock Measures, FRB, H.6 ..... Week Ending December 10
23 Hogs and Pigs, Agriculture ..... December 1
23 Real Earnings, (Press release), BLS ..... November
23 Consumer Price Index (Press release), BLS .. November
23 Treasury Statement (the monthly "budget"), Treasury ..... November
26 Factors Affecting Bank Reserves and Condition Statement of Federal Reserve Banks, FRB, H.4.1 ..... Week Ending December 24

26	Weekly Consolidated Condition Report of Large Commercial Banks and Domestic Subsidiaries, FRB, H.4.2	Week Ending December 17
26	Money Stock Measures, FRB, H.6	Week Ending December 17
30	Export and Import Merchandise Trade, Census, FT-900	November
30	Work Stoppages (Press release), BLS	November
*29-31	Savings and Loan Association Activity (Press release), Federal Home Loan Bank Board	November
31	Agricultural Prices, Agriculture	Mid-December
31	Composite Indexes of Leading, Coincident, and Lagging Indicators (Press release), BEA	November
31	Labor Turnover in Manufacturing (Press release), BLS	November
31	Manufacturers' Shipments, Inventories, and Orders, Census, M3-1	November

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
Subscription Price: $13.00 domestic postpaid; $3.25 additional foreign mailing.

24 Hour CPI Mailgram Service

Consumer Price Index data now are available by mailgram within 24 hours of the CPI release. The new service is being offered by the Bureau of Labor Statistics through the National Technical Information Service of the U.S. Department of Commerce.

The CPI MAILGRAM service provides unadjusted and seasonally adjusted U.S. City Average data both for the All Urban Consumers (CPI-U) and for the Urban Wage Earners and Clerical Workers (CPI-W) Indexes as shown on the CPI-U sample page below. The unadjusted data include the current month's index and the percent changes from 12 months ago and one month ago. The seasonally adjusted data are the percent changes from one month ago.

CONSUMER PRICE INDEX FOR ALL URBAN CONSUMERS (CPI-U): U.S. CITY AVERAGE (1967=100)

GROUP	UNADJ INDEX MAY 1979	UNADJUSTED PER CHG FROM 12 MO AGO	UNADJUSTED PER CHG FROM 1 MO AGO	S ADJ PER CHG FROM 1 MO AGO
ALL ITEMS	214.1	10.8	1.2	1.1
ALL ITEMS(1957-59=100)	249.0	-	-	-
FOOD AND BEVERAGES	228.2	11.2	.8	.7
FOOD	234.3	11.4	.9	.7
FOOD AT HOME	233.4	11.3	.7	.5
CEREALS AND BAKERY PRODUCTS	216.2	9.5	.8	1.0
MEATS, POULTRY, FISH, AND EGGS	242.2	19.4	.9	.1
DAIRY PRODUCTS	203.8	11.1	.7	.8
FRUITS AND VEGETABLES	226.8	3.4	.1	-.2
FOOD AWAY FROM HOME	241.1	11.7	1.1	1.1
HOUSING	222.4	11.3	1.2	1.2
RENT, RESIDENTIAL	173.8	6.8	1.0	1.0
HOMEOWNERSHIP	254.9	14.6	1.3	1.3
FUEL AND OTHER UTILITIES	232.2	7.7	2.1	2.2
FUEL OIL, COAL, AND BOTTLED GAS	364.3	23.2	4.1	4.8
GAS (PIPED) AND ELECTRICITY	251.6	8.2	2.6	2.6
HOUSEHOLD FURNISHINGS AND OPERATION	189.2	7.5	.3	.4
APPAREL AND UPKEEP	166.1	3.9	.4	.0
TRANSPORTATION	207.7	13.4	2.4	1.8
NEW CARS	165.8	8.7	.9	1.1
USED CARS	205.4	11.3	2.7	-.5
GASOLINE	247.7	29.1	5.5	5.0
PUBLIC TRANSPORTATION	193.3	3.1	.4	.7
MEDICAL CARE	236.3	8.9	.5	.6
MEDICAL CARE SERVICES	254.4	9.4	.5	.6
ENTERTAINMENT	187.8	6.6	.7	.5
OTHER GOODS AND SERVICES	193.9	7.5	.4	.5
PERSONAL CARE 1/	193.9	7.5	.6	.6
COMMODITIES	205.8	10.9	1.2	.9
COMMODITIES LESS FOOD AND BEVERAGES	192.9	10.9	1.5	1.0
NONDURABLES LESS FOOD AND BEVERAGES	195.7	12.0	2.0	1.9
DURABLES	189.2	10.0	1.1	.5
SERVICES	229.5	10.3	1.1	1.3
ALL ITEMS LESS FOOD	203.9	10.5	1.3	1.2
ENERGY 1/	260.8	19.8	4.2	4.2
ALL ITEMS LESS FOOD AND ENERGY	204.1	9.5	.9	.9

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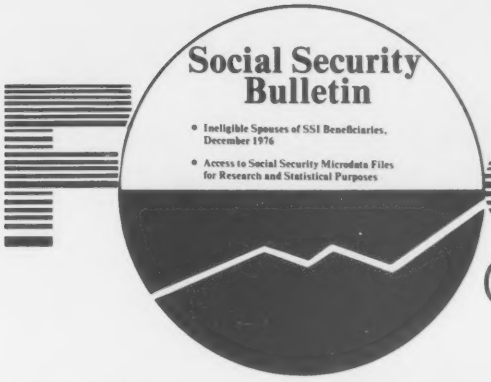
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